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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/726,574
Filing Date: December 04, 2003
Appellant(s): FAN ET AL.

Edwin J. Gale
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on January 15, 2009 appealing from the Office action mailed on February 8, 2008

(1) Real Party in Interest

The real party in interest is Celifor Inc., a Canadian Corporation Vancouver, Canada.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

This appeal involves claims 1-10, 12-32 and 45.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,444,467	Fan et al.	9-2002
5,563,061	Gupta et al.	10-1996

Pierik In vitro Culture of Higher Plants 1997 page 55

Tremblay et al. Plant Cell, Tissue and Organ Culture 42:39-46 1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-10, 12-20, 23-24, 27, 29-32 and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fan et al. (United States Patent No. 6, 444, 467) in view of Pierik (In Vitro Culture of Higher Plants 1997).

For claim 1, Fan et al. teach a method of sowing naked heterotrophic (unlike a zygotic embryo inside a true seed, the somatic embryo is heterotrophic) somatic embryos on a nutrient medium comprising 1-9% of sucrose (column 4, line 10), The solid components are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibres (which are flexible fibbers) and the like (biologically inert) (column 8, lines 50-51). The solid components (discontinuous surface) contain sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54). The somatic embryos are sown on the discontinuous surface (column 8, line 49). The embryos are exposed to environmental conditions effective for growth (column 7, lines 63-67). The sowing and germination steps are carried out *ex-vitro* in non-sterile conditions (column 7, lines 22-25, and abstract, lines 14-17). Fan et al teach Pro-Mix -PGX medium (porous solid growth substrate) (column 10, line 4). Fan et al. teach producing seedlings (young autotrophic plants) from the heterotrophic embryos (abstract). Finally Fan et al. teach growing Pinus radiate, Pinus teada (Loblolly pine), and Picea glauca (spruce) somatic embryos (conifer species).

The prior art teaching of Fan et al. differs from the claimed invention as follows:

For claim 1, Fan et al. fail to teach the content of solids in the medium to a maximum of 10%. Fan et al. also fail to teach nutrient medium comprising gelling agents.

Fan et al. fails to teach a pool of nutrient.

However,

The percentage of solids in the medium is an optimization of process parameters. The reference does not specifically teach a content of 10 % solids in the medium as claimed by Applicant. The percentage of solids in the medium is a clear result of effective parameters that a person of ordinary skill in the art would routinely optimize. Optimization of parameters is a routine practice that would be obvious for a person of ordinary skill in the art to employ. It would have been customary for an artisan of ordinary skill to determine the optimal concentration of solids to help the nutrient to stay in contact with the embryos. One would have also been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient. Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of the content of 10 % solids in the medium would have been obvious at the time of Applicant's invention.

Pierik teaches nutrient media comprising agar to form a gel (page 55).

At the time the invention was made it would have been obvious for one of ordinary skill in the art to modify the method of Fan et al. by adding agar mixed with the nutrient medium knowing that gelling agent serves as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed. Due to the new viscosity of the nutrient medium one of ordinary skill in the art will have to dispense it into a depression to keep it from running off. The mixture of liquid nutrient and agar will form a pool of nutrient. providing an immediate support to the somatic embryos to maintain them in an upright growth orientation. After dissipation of the flowable mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.

Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art.

For dependent claims 2-10, 12-20, 23-24, 27, 29-32 and 45 Fan et al. teach Fan et al. teach a method of sowing naked (uncoated) heterotrophic (unlike a zygotic embryo inside a true seed, the somatic embryo is heterotrophic) somatic embryos on a nutrient medium comprising 1-9% of sucrose (column 4, line 10), The solid components are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibres (which are flexible fibbers) and the like (column 8, lines 50-51). The solid components (discontinuous

surface) contain sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54). The somatic embryos are sown on the discontinuous surface (column 8, line 49). The embryos are exposed to environmental conditions effective for growth (column 7, lines 63-67). The sowing and germination steps are carried out *ex-vitro* in non-sterile conditions (column 7, lines 22-25, and abstract, lines 14-17). Somatic embryos can be sprayed with fungicides, bactericides, antibiotics, nematicides, insecticides and the like (column 5, lines 60-62). Furthermore, Fan et al. teach plant growth regulator(column 4, line 11), mineral compounds, vitamins and amino acids (column 10, lines 45-65). Fan et al. teach a solid component comprising elongated particles (column 12, line 34). Finally Fan et al. teach growing Pinus radiate, Pinus teada (Loblolly pine), and Picea glauca (spruce) somatic embryos. When the somatic is sown onto the surface of the absorbent material (column 8, lines 55-58) it creates a depression in the solid surface.

The prior art teaching of Fan et al. differs from the claimed invention as follows:

Fan et al. fail to teach nutrient medium comprising gelling agents.

Fan et al. also fail to teach a pool of nutrient.

However,

Pierik teaches nutrient media comprising agar to form a gel (page 55).

At the time the invention was made it would have been obvious for one of ordinary in the art to modify the method of Fan et al. by adding agar mixed with the nutrient medium knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed. Due to the new viscosity of the nutrient medium, which can be dispensed under gravity or pressure, one of ordinary skill in the art would have to dispense it into a depression to keep it from running off. The Nutrient medium embeds solid components since the latter line the depression and will form a pool of nutrient. providing an immediate support to the somatic embryos to maintain them in an upright growth orientation. After

dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.

Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art.

Claims 21, 22, 25, 26, 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fan et al. (United States Patent No. 6, 444, 467)in view of Pierik as applied to claims 1-10, 12-20, 23, 24, 27, 29-32 and 45 above and further in view of each of Gupta (United States Patent 5,563,061 1996) and of Tremblay et al. (Plant Cell, Tissue and Organ Culture 42: 39-46 1995).

For dependent claims 21,22,25,26, and 28, the prior art teaching of Fan et al. and Pierik differ from the claimed invention as follows:

For dependent claims 21, 22, 25, 26, and 28 Fan et al. fail to teach the use of monosaccharides in the nutrient medium. Fan et al. fail to use of monosaccharides such as glucose or fructose as carbohydrate. Fan et al. also fail to teach maltose as a carbohydrate nutrient

However,

Tremblay et al. teach the use of monosaccharides (glucose and fructose), oligosaccharides and combinations of these sugars in the nutrient medium.

Gupta teaches the use of 3% of maltose in embryos culture as a carbohydrate nutrient.

At the time the invention was made it would have been obvious for one of ordinary in the art to modify the method of Fan et al. in view of Pierik by using monosaccharides, oligosaccharides and combination of, knowing that mixtures of simple carbohydrates as compared to monotype carbohydrate, may similarly promote or improve growth of conifer somatic germinants" (page 34). Moreover, it would have been obvious for one of the ordinary in the art to use maltose as carbohydrate in light of the fact that Gupta teaches that maltose is a growth enhancer *in vitro.* For the above reasons, it is believed that the rejection is proper and should be sustained.

(10) Response to Argument

Appellants argue that the rejection of claims 1-10, 12-20, 23-24, 27, 29-32 and 45 as unpatentable under 35 U.S.C. §103(a) over Fan et al. in view of Pierik is in error in that the steps set forth in the independent claims (claims 1, 32 and 45) would not have been obvious from the applied references, taken together, or however combined, at the time the invention was made. It is submitted that the rejection is in error in that certain elements required by the independent claims are missing from the cited references. In particular, the provision of "nutrient medium comprising particles of a solid component contained within a flowable component containing water and a carbohydrate nutrient ... said flowable component being selected from ... a fluid and a semi-solid, and said solid particles being present at a concentration of up to 10% (w/v)" (e.g. claim 1) is not disclosed nor made obvious. When the cited references disclose any material for contact with embryos, it is either a growth substrate comprising mostly solids or a solids-free liquid for supplying a nutrient. The particular nutrient medium required by Appellant's claims is unobvious absent the benefit of hindsight when the advantages of prolonged water and nutrient supply to the embryos or germinants, together with even longer physical support provided by the medium become apparent.

These arguments are not persuasive because all claimed elements are cited in the prior art. Fan et al. teach a nutrient medium comprising 1-9% of sucrose (column 4, line 10), solid, liquid and gas phases (column 3, lines 62-63) for growth of somatic embryos into an autotrophic seedling. The somatic embryo is placed in contact with said liquid medium containing **sucrose** (column 4, lines 9-11). The **solid** components are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibres (which are flexible fibers) and the like (column 8, lines 50-51). The solid components contain sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54). The embryos are exposed to environmental conditions effective for growth (column 7, lines 63-67). The sowing and germination steps are carried out *ex-vitro* in non-sterile conditions (column 7, lines 22-25, and abstract, lines 14-17). Fan et al. also teach sowing somatic embryos in a three-phase growing medium which was irrigated or "drenched" with nutrient solutions (column 11, lines 9-12). Fan et al. teach a solid component comprising elongated particles (column 12, line 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (column 8, lines 50-54). Finally Fan et al. teach growing *Pinus radiata*, *Pinus teada* (Loblolly pine), and *Picea glauca* (spruce) somatic embryos, which are conifer species. Pierik teaches nutrient media comprising agar to form a gel. At the time the invention was made it would have been obvious for one of ordinary in the art to modify the method of Fan et al. by mixing agar with the nutrient medium (**semi-solid**) knowing that gelling agent serve as binding agent for nutrient and water,

thus adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a **continuing physical support**.

Fan et al. teach sowing the somatic embryos on discontinuous physical substrate (solid component)containing liquid medium. By adding agar (taught by Pierik) to the liquid medium it will raise the viscosity of the medium , thus the semi-solid medium formed will remain in contact with the embryo providing the nutrition needed for its development. After the semi-solid component (liquid medium + Agar) is fully absorbed the solid component remain to provide continued physical support for the embryos . The amount of solid component taught by Fan et al. would have the same effect as the amount of solids claimed in the present invention.

It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233; *In re Reese* 129 USPQ 402. Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of the content of 10 % solids in the medium would have been obvious at the time of Applicant's invention

Appellants argue that in the case of claim 45, there are additional requirements that are not disclosed in the prior art. These additional requirements are that the nutrient medium (containing a semi-solid component) be dispensed to form a pool on the surface of the growth medium, and that the embryos or germinants be contacted with the nutrient medium in such a manner that the pool provides the embryos or germinants with physical support to maintain a generally upright growth orientation. It is furthermore submitted that the rejection of claims 21, 22, 25, 26 and 28 as unpatentable under 35 U.S.C. §103(a) over Fan et al. in view of each of Gupta and Tremblay et al. is in error. Firstly, these claims are dependent claims and they are patentable for the same reasons as the claims from which they depend. Additionally, however, the Examiner has not recognized that somatic embryogenesis involves several steps that are quite different from each other and has cited features from earlier steps of somatic embryogenesis against the claims of the present application which are confined to **a final step of converting embryos or germinants into autotrophic seedlings**. A person of ordinary skill in the art would recognize that features or materials designed for one step of somatic embryogenesis would not likely be effective for another step, and this is particularly so when comparing early steps (e.g. embryo proliferation or maturation)with the last step (conversion to seedlings). The subject matter of the rejected claims is therefore unobvious for this additional reason.

These arguments are not persuasive because it does not appear that the claim language or limitations result in a manipulative difference in the method steps when compared to the prior art disclosure.

Fan et al. teach a solid component comprising elongated particles (**particles of a solid component**) (column 12, line 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (**pool of nutrient medium**) (column 8, lines 50-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium (**semi-solid component**) knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because the somatic embryos will lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent.

Appellants claim a method of sowing a somatic embryo (defined in the specification page 19, lines 24-27 as a plant embryo formed in vitro from vegetative (somatic) cells by mitotic division of cells). Fan et al. teach a process of sowing a somatic embryo (defined as embryo formed in vitro from vegetative (somatic) cells by mitotic division of cells, column 6, lines 25-26) in environmental condition to facilitate growth and development into complete seedlings possessing shoots and roots (abstract). As the present invention the prior art teach converting somatic embryos into autotrophic seedlings.

Appellants argue that none of the references describe the steps of providing a nutrient medium comprising particles of a solid component contained within a flowable component containing water and a carbohydrate nutrient, the flowable component being a fluid and a semi-solid, and the solid particles being present in a concentration up to 10% (w/v), dispensing a quantity of the nutrient medium onto a surface of a porous solid growth substrate, and contacting a somatic plant embryo or germinant with the nutrient medium. There is no disclosure of the use of particles of a solid component in a nutrient medium being used to provide enduring physical support for germinants and seedlings once a flowable component thereof has dissipated. Additionally, when considering claim 45, none of the cited references disclose the provision of a pool of nutrient medium to hold and maintain embryos or germinants in a generally upright position for proper growth.

These arguments are not persuasive because Fan et al. teach a solid component (**particles of a solid component**) (column 12, line 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (column 8, lines 50-54). Fan et al. also teach sowing somatic embryos in a three phase growing medium which was irrigate or "drench" with nutrient solutions (column 11, lines 9-12). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium (**semi-solid component, pool of nutrient**) knowing that gelling agent serves as a binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no

added water or nutrient will be needed because they will be contained in the gelling agent. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a **continuing physical support**.

Appellants argue that it is pointed out that the Examiner's analysis of Fan et al. is incorrect and/or relies on features picked from Fan et al. without consideration of the context in which they are presented. Fan et al. disclose a multi-step process to produce seedlings from somatic embryos. The first main step involves "pre-germination" followed by placing the embryos into a state of physical dormancy (Col. 3, lines 43 to 51). The second main step involves placing the pre-germinated embryos developed in this way on or within the surface of a three-phase substrate (e.g. soil or soil-substitute - the phases being solid liquid and gas), and then transferring the substrate containing the pre-germinated embryos into an environmentally-controlled plant growth environment and applying water and/or nutrient solutions at regular intervals (e.g. by misting with micro-droplets or by drenching - Col. 3, line 60 to Col. 4, line 7 and Col. 11, lines 5 to 10). The claims of the present invention have nothing to do with "pre-germination", i.e. the first step, and are limited to the step of sowing the embryos or germinants for their transformation into seedlings; therefore any disclosure in Fan et al. that relates to the pre-germination step is irrelevant to the present invention. Pre-germination is preferably carried out *in-vitro* in sterile conditions (Col. 5, lines 44-46) and is preferably followed by the step of placing the embryos into a state of physical dormancy, e.g. by desiccation (Col. 4, lines 46 and 47). The Examiner seems to have overlooked this distinction. For example, the Examiner states (page 2) that: "The solid components are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibers (which are flexible fibbers) and the like". In support of this, the Examiner cites Column 8, lines 50-51 of Fan et al., but this part of Fan et al. describes the pre-germination step. The passage at Col. 8 lines 48 to 54 reads: "Alternatively, the somatic embryos can be successfully pre-germinated on discontinuous physical substrates comprised of materials such as but not limited to, vermiculite, perlite, peat, coconut husk fibers and the like, said discontinuous supports containing sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos." Not only does this clearly relate to pre-germination, but the objective is to provide a thin capillary layer or film of liquid around the embryo. Such a layer would not last long in an environment provided for non-sterile *ex-vitro* sowing and conversion to seedlings. The somatic embryos can be sown onto the surface of the absorbent material by hand or by the means of a mechanical sowing device such as but not restricted to conventional seeding equipment." Again, this relates to pre-germination (see Col. 8, lines 48 and 49, which set the context for the above passage). Moreover, the Examiner's statements regarding the formation of a depression and the provision of physical support are not mentioned in this passage and appear to be speculative and not shown in the cited document. In case it may be argued that sowing for pre-germination is the same as sowing for growth into seedlings, it should be kept in mind that the broad claims of the present application require "exposing said embryo or germinant to environmental conditions effective for growth into an autotrophic seedling". This is clearly not done during pre-germination (because the embryos are to be converted to autotrophic seedlings by Fan et al. only in a later step). Moreover, as the passages quoted above show, the intention during pre-germination is to cover the surfaces of the embryos with a capillary layer or film of liquid medium, whereas, in the broad claims of the present application, the intention is to contact the embryos or germinants with a quantity of nutrient medium dispensed onto the surface of a growth substrate, which may not result in the formation of a capillary layer of liquid around the embryos, and is likely not to do so. Not only does this clearly relate to pre-germination, but the objective is to provide a thin capillary layer or film of liquid around the embryo. Such a layer would not last long in an environment provided for non-sterile *ex-vitro* sowing and conversion to seedlings. "After the pre-germinated somatic embryos are sown onto the surfaces of the rooting substrates, if desired, the embryos may be covered with a thin layer of additional rooting substrate that may be comprised of the same material underneath the embryos or alternatively, with a different type of material. One non-limiting example is sowing the pre-germinated embryos onto PRO-MIX-PGX medium, then overlaying the embryos with a thin layer of coconut husk fibres." This is very much like a conventional process of planting seeds and then covering them with a thin layer of soil. There is no suggestion that the covering layer should contain a flowable component selected from fluid or semi-solid, and clearly, in the procedure of Fan et al. the solid particles would often be present in an amount approaching 100% rather than 10% or less required by the claims of the present application. At Col. 10, lines 45 to 50, Fan et al. state: "Another important feature of the invention, at least in

preferred forms, is that the exogenous nutrients, including but not restricted to carbohydrates and minerals, required for successful somatic embryo pre-germination and subsequent growth and development may be applied as aerosols. The nutrient solutions maybe applied with, but not restricted to, conventional misting and/or fogging equipment." "After the pre-germinated somatic embryos are sown onto the surfaces of the rooting substrates, if desired, the embryos may be covered with a thin layer of additional rooting substrate that may be comprised of the same material underneath the embryos or alternatively, with a different type of material. One non-limiting example is sowing the pre-germinated embryos onto PRO-MIX-PGX medium, and then overlaying the embryos with a thin layer of coconut husk fibres." This is very much like a conventional process of planting seeds and then covering them with a thin layer of soil. There is no suggestion that the covering layer should contain a flowable component selected from fluid or semi-solid, and clearly, in the procedure of Fan et al. the solid particles would often be present in an amount approaching 100% rather than 10% or less required by the claims of the present application. At Col. 10, lines 45 to 50, Fan et al. state: "Another important feature of the invention, at least in preferred forms, is that the exogenous nutrients, including but not restricted to carbohydrates and minerals, required for successful somatic embryo re-germination and subsequent growth and development may be applied as aerosols. The nutrient solutions maybe applied with, but not restricted to, conventional misting and/or fogging equipment." also fail to disclose the step of dispensing a quantity of nutrient medium (containing a solid particle) onto a surface of a porous solid growth substrate and contacting the embryos with the nutrient medium. Moreover, there is no disclosure of solid particles from the nutrient medium remaining to provide continued physical support for the seedlings after dissipation of the other components of the medium.

These arguments are not persuasive because the solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos. Fan et al. teach sowing the somatic embryos on physical substrates comprised of materials such as but not limited to vermiculite, perlite, peat, coconut husk fibres containing sufficient liquid medium to enable the formation of a thin capillary layer. (column 8, lines 49-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the liquid nutrient medium knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent, which will adhere to the somatic embryos, thus no more need for misting and /or fogging or drenching. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support. Furthermore the fact that the growing step (taught by Fan et al.) relate to pre-germination step is not relevant, because somatic embryos at the pre-germinated stage are heterotrophic somatic plant embryos as claimed in the present application.

Appellants argue that the Examiner relied on Pierik to overcome the deficiencies of Fan et al. The Examiner stated: "Pierik teaches nutrient media comprising agar to form a gel (page 55)". It is to be noted that Pieirik is entitled: "In

Vitro Culture of Higher Plants" (see title page) It is therefore clearly concerned only with tissue culture *in vitro.* This is reinforced by the statement on page 56 at lines 7 and 8 that: *"In* vitro growth may be adversely affected if the agar concentration is too high." The broad claims of the present application specifically require the steps to be carried out *e×-vitro.* It would seem that Pierik is concerned with the type of culture steps that take place on solid gelled media in sterile conditions, e.g. the type of propagation and maturation steps that are typically carried out in the earlier phases of somatic embryo development. Pierik states on page 56 at lines I to 6 that: "The usual concentration for agar is 0.6-0.8%. If a lower concentration (0.4%) is used then the nutrient medium remains sloppy, especially when the pH is also low. If a high concentration (1.0%) is chosen, then the nutrient medium is very solid, making inoculation difficult. If 0.6% is used and the medium remains sloppy then the pH should be corrected; if the pH is lower than 4.5-4.8 a medium with 0.6% agar does not gel properly." The implication of this passage is that the nutrient medium should range in solidity between being too sloppy and very solid. This teaches away from the use of a "flowable" medium as required by the claims of the present invention. The Examiner stated (page 3) that: "The percentage of solids in the medium is an optimization of parameters. The reference does not specifically teach a content of 10% solids as claimed by Applicant. The percentage of solids in the medium is a clearly result effective parameters that a person of ordinary skill in the art would routinely optimize." The Examiner seems to be confusing the requirement for 10% solids in the claims of the present application with the amount of agar used in gelled media of the kind described by Pierik. However, these are two different things. The nutrient medium of the present invention contains particles of a solid component (such as fibers of alpha-cellulose) and (at least in preferred embodiments) a gelling agent such as agar, gellan gum, etc. (claim 15) which is regarded (in the concentrations employed) as a semi-solid. On the other hand, the media of Pierik do not contain particles of a solid of any kind. It is stated on page 55 line 6 that solubilized agar may form a gel that can "absorb compounds", but this presumably means that it can absorb compounds in solution. There is no reference to the incorporation of solid particles into the gel. Indeed, since the medium is intended to provide nutrients to tissues, it is difficult to see how solid particles would make a contribution to this. In the embodiments of the present application, the solid particles are employed in order to provide physical support for the seedlings. Therefore, contrary to the suggestion of the Examiner, a person of ordinary skill in the art, upon reading Pierik, would not see the need to optimize the solids content to a maximum of 10% as a routine optimization of Pierik, because Pierik does not suggest the use of any solids whatsoever. The Examiner continued (page 3/4): "It would have been customary for an artisan of ordinary skill to determine the optimal concentration of solids to help the nutrient to stay in contact with the embryos, thus giving more usefulness to the method. One would also have been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient. Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of the content of 10% solids in the medium would have been obvious at the time of Applicant's invention." As noted, since Pierik discloses no content of particles of a solid, this statement makes no sense. Again, there is apparent confusion between the gelling agent and the particles of a solid component.

These arguments are not persuasive because Pierik teaches nutrient media comprising agar to form a gel (semi-solid component), it was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent, which will adhere to the somatic embryos.

Examiner is not confusing the requirement for 10% solids in the claim of the present application with the amount of agar used in the media described by Pierik. Examiner is aware of the fact that Pierik is not teaching solid

components , Fan et al. teach the **solid components** which are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibres (which are flexible fibbers) and the like (column 8, lines 50-51). The solid components contain sufficient liquid medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the liquid nutrient medium to obtain a **semi-solid** medium knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent, which will adhere to the somatic embryos. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.

The reference (Fan et al.) does not specifically teach a content of **10 %** solids in the medium as claimed by Applicant. The percentage of solids in the medium is an optimization of parameters. The percentage of solids in the medium is a clearly result effective parameters that a person of ordinary skill in the art would routinely optimize. Optimization of parameters is a routine practice that would be obvious for a person of ordinary skill in the art to employ. It would have been customary for an artisan of ordinary skill to determine the optimal concentration of solids to help the nutrient to stay in contact with the embryos, thus giving more usefulness to the method. One would have also been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient and to keep a continuing support to the somatic embryos after dissipation of the mixture (nutrient, water and agar). Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of the content of 10 % solids in the medium would have been obvious at the time of Applicant's invention.

Appellants argue that the statement that "the low percentage of solids in the medium will raise the surface of the embryos in contact with the nutrient" seems to have no bearing on Pierik, Fan et al. or the present invention and, to the extent that it can be understood, is wrong. The surfaces of the embryos are not raised by the solids in the medium. In the claimed invention, the solids in the medium provide support for the embryos or germinants. Considering the teachings of Fan et al. and Peirik objectively, there is no reason why a person of ordinary skill in the art would consider them to be related. Pierik is concerned with *in-vitro* tissue culture. After the pre-germination step, Fan et al. are concerned with growing the embryos into seedlings *ex-vitro.* They do this by transferring the embryos to a growth substrate, possibly covering the embryos with the same or another growth substrate, and then expose the

embryos to growth conditions. Nutrient medium is either supplied by periodic misting or fogging, or by a preliminary drench of the growth substrate prior to sowing. The use of a gelling agent in the nutrient medium in either of these methods would be counter\-productive or impossible. A gelling agent would make misting or fogging impossible. A gelling agent in the medium intended for drenching would make the medium unsuitable for drenching or would form a gel within the growth substrate. Neither procedure (misting/fogging or drenching) could be expected to be improved by the incorporation of a gelling agent or particles of a solid and, even if this were not the case, there would still be a missing element, i.e. there would be nothing to suggest that the nutrient medium should be made to contain particles of a solid component in an amount of up to 10% in order to provide continuing physical support for the seedling after dissipation of the other components of the medium. The statement that "the low percentage of solids in the medium will raise the surface of the embryos in contact with the nutrient" seems to have no bearing on Pierik, Fan et al. or the present invention and, to the extent that it can be understood, is wrong. The surfaces of the embryos are not raised by the solids in the medium. In the claimed invention, the solids in the medium provide support for the embryos or germinants. Considering the teachings of Fan et al. and Peirik objectively, there is no reason why a person of ordinary skill in the art would consider them to be related. Pierik is concerned with *in-vitro* tissue culture. After the pre-germination step, Fan et al. are concerned with growing the embryos into seedlings *ex-vitro.* They do this by transferring the embryos to a growth substrate, possibly covering the embryos with the same or another growth substrate, and then expose the embryos to growth conditions. Nutrient medium is either supplied by periodic misting or fogging or by a preliminary drench of the growth substrate prior to sowing. The use of a gelling agent in the nutrient medium in either of these methods would be counter productive or impossible. A gelling agent would make misting or fogging impossible. A gelling agent in the medium intended for drenching would make the medium unsuitable for drenching or would form a gel within the growth substrate. Neither procedure (misting/fogging or drenching) could be expected to be improved by the incorporation of a gelling agent or particles of a solid and, even if this were not the case, there would still be a missing element, i.e. there would be nothing to suggest that the nutrient medium should be made to contain particles of a solid component in an amount of up to 10% in order to provide continuing physical support for the seedling after dissipation of the other components of the medium. In short, Pierik does not serve to cure the deficiencies of Fan et al. It is submitted that the Examiner has failed to establish a *prima facie* case of obviousness based on the factual inquiries laid out in Graham v. John Deere Co., 148 USPQ 459 0966). As highlighted in MPEP 2142: "The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the Examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of non-obviousness." In the present case, particularly in view of the misinterpretation of the teaching of both Fan et al. and Pierik, and the absence of claimed elements as outlined above, it is submitted that the Examiner has relied upon a faulty line of reasoning to justify the obviousness rejection. Accordingly, it is believed that the rejection of the indicated claims over Fan et al. in view of Pierik is in error and should be reversed.

These arguments are not found persuasive because it is noted that the claimed methods recite, “comprising” which leaves the claim open for the inclusion of other steps. See MPEP 2111.03.

The fact that Pierik teaches In Vitro culture instead of Ex Vitro has nothing to do with the fact that Pierik teaches that agar can be used as a gelling agent. Pierik teach using agar in medium to grow somatic embryos. It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the liquid nutrient medium comprising solid component (taught by Fan et al. column 8, lines 49-54) knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed, because they will

adhere to the somatic embryos, thus misting/fogging or drenching will not be needed anymore. The addition of agar to the liquid nutrient medium will result to a method which will be more desirable because it will be cheaper (lower maintenance). MPEP 2144. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.

Appellants argue that the Examiner further rejected claims 21, 22, 25, 26 and 28 as unpatentable over Fan et al. in view of each of Gupta and Tremblay et al. (page 4). The rejected claims relate to the identity and quantity of the carbohydrate nutrient employed in the nutrient medium. These claims are dependent claims and they are dependent directly or indirectly on claim 1. The Examiner stated that the teaching of Fan et al. differs from the claimed invention as follows (page 4): "Fan et al. fail to teach the use of monosaccharides in the nutrient medium. Fan et al. fail to use glucose or fructose as carbohydrate. Fan et al. also fail to teach maltose as a carbohydrate nutrient. Finally Fan et al. fail to teach the content of solids in the medium to a maximum of *10%*" The Examiner omitted to mention here that Fan et al. also fail to teach a nutrient medium comprising gelling agents (as previously admitted by the Examiner).

The teaching of Fan et al. has been discussed extensively above. In particular it is submitted that the use of particles of a solid component up to 10% in the nutrient medium is unobvious from Fan et al. even in consideration with the teaching of Pierek. For this reason and others, it is believed that claim 1 of the present application is unobvious from Fan et al. Since claims 21, 22, 25, 26 and 28 are dependent directly or indirectly from claim 1, it is believed that these claims are also unobvious for the same reasons as claim 1. In particular, Gupta and Tremblay et al. do not suggest the use of particles of a solid component up to 10% in a nutrient medium and thus do not compensate for the lack of teaching of Fan et al. in this regard. Indeed, Gupta and Tremblay et al. were not cited by the Examiner for this purpose. On the contrary, Gupta was cited to show the use of 3% maltose as a carbohydrate nutrient in embryo culture, and Tremblay et al. was cited to show the use of monosaccharides (glucose and fructose), oligosaccharides and combinations thereof in a nutrient medium.

It repeated that the claims of the present application relate only to the step of transforming somatic embryos or germinants into autotrophic seedlings (see claim 1, lines 1 and 2). As disclosed by Gupta (see, for example, the Abstract), there are several steps in somatic embryogenesis and the conversion of embryos into plants. These steps include the excision of suitable tissue, the generation of embryogenic tissue, the propagation of embryogenic cells, the conversion into embryos and the maturation of such embryos and then (optionally) pre-germination, desiccation and storage of the mature embryos. Finally, the mature embryos are converted into seedlings. The steps up to and including desiccation generally take place in sterile conditions using *in-vitro* procedures. Each step generally requires the use of a specific medium for propagation, maintenance, culturing, transformation, etc. and the ingredients of the medium (as well as environmental conditions) are carefully selected and controlled to ensure that the requirements and goals of the particular step are achieved. Accordingly, ingredients chosen for one step in such a procedure may not be suitable for some or all other steps and may indeed be harmful. For this reason, the Examiner's reliance on Gupta and Tremblay et al. is unsound because these references do not relate to the step to which the claims of the present invention relate, i.e. the sowing and transformation of embryos or germinants into autotrophic seedlings. As its title shows, Tremblay et al. relates to the maturation of black spruce somatic embryos. Maturation is the step of culturing immature embryos in a suitable medium to allow the embryos to develop the internal resources and possibly external characteristics necessary to undergo germination in a subsequent step. Tremblay et al. investigated the effects of sucrose, fructose and glucose on embryo maturation. Each of fructose and glucose produced fewer mature embryos (Abstract, line 7) compared to sucrose, thus teaching away from the use of these carbohydrates in the Tremblay et al. operations. Moreover, the article concluded that "the action of sucrose on embryo maturation is mostly achieved through an osmotic control" (Abstract, line 12). In other words, sucrose is not acting as a nutrient and acts instead to generate osmotic pressure by physical means. Therefore, even if a person of ordinary skill in the art would think of using a medium developed for embryo

maturation as a nutrient medium for transformation of embryos or germinants into seedlings (which Appellant asserts would not be the case), the results of Tremblay et al. would discourage or teach away from the use of sucrose (and even more so, glucose and fructose) as a nutrient for the medium. Gupta teaches the use of maltose as a carbon and energy source in the maintenance and multiplication cultures of somatic embryos (see Abstract, line 18). Gupta concludes: "The use of maltose at earlier stages of embryo development is more important than its use for embryo maturation" (Abstract, lines 21 to 23). This shows that (a) Gupta is concerned only with particular stages of embryo development up to embryo maturation, and (b) that maltose was more effective for embryo development than for embryo maturation, thus showing that a component effective for one stage may not be preferred for another stage. It is to be noted that, while Gupta mentions germination before or after storage and transplanting to Soil for further growth (Abstract, lines 16 and 17), there is no suggestion by Gupta of the use of maltose for such steps. It is therefore submitted that a person of ordinary skill in the art would not see either one of Tremblay et al. and Gupta as relevant to the transformation of mature embryos or germinants into seedlings, and thus would not see Tremblay et al. and Gupta as relevant to the present invention.

These arguments are not persuasive because it is noted that the claimed methods recite, “comprising” which leaves the claim open for the inclusion of other steps. See MPEP 2111.03. Fan et al. teach a process of producing somatic seedlings from a somatic embryo. The process may be carried out using conventional seed handling equipment. The process does not require the use of aseptic techniques or sterilized media or equipment (ex-vitro) (Fan et al., abstract). The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant. *In re Linter* , 458 F.2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* , 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), cert. denied , 500 U.S. 904 (1991). Although Ex parte Levengood, 28 USPQ2d 1300, 1302 (Bd. Pat. App. & Inter. 1993) states that obviousness cannot be established by combining references "without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done " (emphasis added), reading the quotation in context it is clear that while there must be motivation to make the claimed invention, there is no requirement that the prior art provide the same reason as the applicant to make the claimed invention. Obviousness can be established for achieving the claimed product for different reasons and the prior art/examiner does not need to know all of the properties of the claimed invention *In re Dillon*, 16 USPQ2d 1897 (Fed. Cir. 1990); however there must be some suggestion or motivation. Therefore, the reason or motivation to combine may often suggest doing what the inventor has done, but for a different purpose or to solve a different problem than that asserted by the inventor. See MPEP 2144. Moreover, the strongest rationale for combining reference is a recognition, expressly or implicitly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal

precedent that some advantage or expected beneficial result would have been produced by their combination In re Sernaker 17 USPQ 1, 5-6 (Fed. Cir. 1983) see MPEP 2144.

In this case, the motivation of combining the teaching of Fan et al. with the teaching of Pierik is to lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent, which will adhere to the somatic embryos. The motivation of using 10% of solid component would be to use this percentage to help the most of the nutrient to stay in contact with the embryos, thus giving more usefulness to the method. One would have also been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient and to keep a continuing support to the somatic embryos after dissipation of the mixture (nutrient, water and agar).

The motivation of combining the teaching of Fan et al. with the teaching of Gupta and further with the teaching of Tremblay et al. would be that a person having ordinary skill in the art would have known "that mixtures of simple carbohydrates as compared to monotype carbohydrate, may similarly promote or improve growth of conifer somatic germinants" (page 34 of the specification). Moreover, it would have been obvious for one of the ordinary in the art to use maltose as carbohydrate in light of the fact that Gupta teaches that maltose is a growth enhancer *in vitro*.

Appellants argue that It is noted that the Examiner did not specifically comment on the limitations in claim 45 that are not present in claims 1 and 32, i.e. that the nutrient medium forms a pool and the embryo or germinant is contacted with the pool to provide the embryo or germinant with physical support to maintain a generally upright growth orientation after sowing. These features are missing from all of the cited prior art references and are unobvious therefrom as there is no suggestion of providing support for the embryos at this stage of their sowing.

These arguments are not persuasive because it does not appear that the claim language of claim 45 or limitations result have a manipulative difference in the method steps when compared to the prior art disclosure.

Fan et al. teach a solid component comprising elongated particles (**particles of a solid component**) (column 12, line 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (**pool of nutrient medium**) (column 8, lines 50-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium (**semi-solid component**) knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in

the art would have been motivated to do that because the somatic embryos will lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent. The mixture of the liquid nutrient with agar (semi-solid component) will also provide an immediate physical support to the somatic embryos to maintain them in an upright growth orientation. It is well know in the art that embryos need physical support at any stage of their sowing.

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(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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